

WHAT IS CLAIMED IS:

1                   1.     A virtualization controller for controlling data transfer between a host  
2     system and a plurality of storage devices, the virtualization controller comprising:  
3                   a plurality of first ports for connection with the plurality of storage devices  
4     each having a storage area to store data;  
5                   a second port for connection with the host system;  
6                   a processor; and  
7                   a memory configured to store volume mapping information which correlates  
8     first identification information used by the host system to access a first storage area in one of  
9     the storage devices, with second identification information for identifying the first storage  
10    area, the correlation being used by the processor to access the first storage area; and  
11                  wherein when data stored in the first storage area is transferred to a second  
12    storage area in one of the storage devices, the processor correlates the first identification  
13    information with a third identification information for identifying the second storage area and  
14    registers the first identification information and the third identification information in the  
15    volume mapping information.

1                   2.     The virtualization controller as recited in Claim 1, wherein, upon  
2     receipt of data including the first identification information, the virtualization controller  
3     controls data transfer of the data between the host system and the first storage area based on  
4     the correlation of identification information in the volume mapping information.

1                   3.     The virtualization controller as recited in Claim 1, wherein the second  
2     identification information for identifying the first storage area comprises real port  
3     identification of the storage device containing first storage area and LUN designating the first  
4     storage area.

1                   4.     The virtualization controller as recited in Claim 3, wherein the second  
2     identification information for identifying the first storage area comprises personal  
3     identification of the first storage area contained in the storage device.

1                   5.     The virtualization controller as recited in Claim 1,  
2                   wherein the memory is configured to store routing information which indicates  
3     a relationship of connection among the virtualization controller, the storage devices, and the  
4     host system;

5                    wherein the processor, upon receipt of data from the host system or any of the  
6 storage devices, decides whether to give the data identification information or not according  
7 to identification information stored in the volume mapping information, and if the processor  
8 decides not to give the data identification information, sends the received data to the host  
9 system or any of the storage devices according to the routing information.

1                    6.        The virtualization controller as recited in Claim 1, wherein the first  
2 storage area and the second storage area are storage areas of different storage devices.

1                    7.        The virtualization controller as recited in Claim 6,  
2                    wherein when transfer of data stored in the first storage area to the second  
3 storage area is started, if a request for access to the first storage area is received from the host  
4 system, the processor holds the access request; and  
5                    wherein, upon completion of the transfer of data, the processor sends the held  
6 access request to the storage device having the second storage area.

1                    8.        The virtualization controller as recited in Claim 1, wherein the  
2 processor is configured to notify another virtualization controller of the volume mapping  
3 information.

1                    9.        The virtualization controller as recited in Claim 1, further comprising a  
2 third port for connection with a managing unit which is configured to control the  
3 virtualization controller, wherein the processor is configured to monitor a state of connection  
4 with the storage devices connected through the plurality of first ports, and if a change in the  
5 connection state is detected, to notify the managing unit of the change in the connection state.

1                    10.      A data control system connected to one or more host systems, the data  
2 control system comprising:  
3                    a plurality of storage devices each having a storage area; and  
4                    a switch which is connected with the plurality of storage devices and the one  
5 or more host systems, the switch including:  
6                    a plurality of first ports for connection with the storage devices;  
7                    one or more second ports for connection with the one or more host  
8 systems;  
9                    a memory configured to store information on a correlation between  
10 first identification information used by the host system to access a first storage area of one of

11 the storage devices, and second identification information for identifying the first storage  
12 area; and  
13 a routing processor configured to convert data with the first  
14 identification information received from the host system into data with the second  
15 identification information and to send the converted data to the storage device having the first  
16 storage area according to the correlation information;  
17 wherein when data stored in the first storage area is transferred to a second  
18 storage area of one of the storage devices, the routing processor converts data with the first  
19 identification information into data with third identification information for identifying the  
20 second storage area and sends the converted data to the storage device having the second  
21 storage area.

1 11. The virtualization controller as recited in Claim 10, wherein the second  
2 identification information for identifying the first storage area comprises real port  
3 identification of the storage device containing first storage area and LUN designating the first  
4 storage area.

1 12. The data control system as recited in Claim 10,  
2 wherein the switch further comprises a data transfer processor which controls  
3 the process of transferring data stored in a storage area of one of the storage devices to  
4 another storage area of one of the storage devices, and  
5 wherein when data stored in the first storage area is transferred to the second  
6 storage area, the data transfer processor correlates the first identification information with the  
7 third identification information and registers and stores the correlation information in the  
8 memory.

1 13. The data control system as recited in Claim 12, wherein the first  
2 storage area and the second storage area are storage areas of different storage devices.

1 14. The data control system as recited in Claim 12, further comprising a  
2 managing unit connected with the switch, wherein the managing unit has a volume manager  
3 which is configured to send the correlation information to the switch and to set the correlation  
4 information for the switch.

1 15. The data control system as recited in Claim 12,

2                    wherein when transfer of data stored in the first storage area to the second  
3 storage area is started, if a request for access to the first storage area is received from the host  
4 system, the routing processor holds the access request; and

5                    wherein, upon completion of the transfer of data, the routing processor sends  
6 the held access request to the storage device having the second storage area.

1                    16.     A method of controlling data transfer in a system including a host  
2 system which uses first identification information to access a first storage area in one of a  
3 plurality of storage devices, wherein the first storage area includes data associated with  
4 second identification information identifying the first storage area, the method comprising:  
5                    issuing a data transfer request to the first storage device to transfer the data  
6 with the second identification information in the first storage device to a second storage  
7 device; and  
8                    upon receipt of notification of completion of data transfer from the first  
9 storage device to the second storage device, correlating the first identification information  
10 with a third identification information identifying the second storage area containing the  
11 transferred data.

1                    17.     The method of controlling data transfer as recited in Claim 16, further  
2 comprising:  
3                    registering the first identification information and the third identification  
4 information in a volume mapping information and storing the volume mapping information in  
5 a memory; and  
6                    converting the data with the first identification information transferred from  
7 the first storage device into data with the third identification information transferred to the  
8 second storage device.

1                    18.     The method of controlling data transfer as recited in Claim 16, further  
2 comprising:  
3                    holding an access request to the first storage device after issuance of the data  
4 transfer request; and  
5                    sending the held access request to the second storage device after receipt of  
6 notification of completion of the data transfer.

1                   19.     A method of connecting a virtualization controller between a host  
2 system and a storage device which are connected through a first path between a first port of  
3 the host system and a first port of the storage device and a second path between a second port  
4 of the host system and a second port of the storage device, the method comprising:  
5                   accessing a storage area of the storage device;  
6                   disconnecting the second path between the second port of the host system and  
7 the second port of the storage device;  
8                   connecting the second port of the host system with the virtualization controller  
9 through a third path;  
10                  connecting the virtualization controller with the second port of the storage  
11 device through a fourth path; and  
12                  setting, on the virtualization controller, identification used by the host system  
13 to identify the storage area, identification information for the second port of the storage  
14 device, and virtual port identification information for the virtualization controller, which are  
15 correlated to define access of the storage area by the host system.

1                   20.     The method as recited in Claim 19, further comprising:  
2                   sending, from the virtualization controller to the host system, the identification  
3 information used by the host computer to identify the storage area, and the virtual port  
4 identification information;  
5                   sending, from the host system to the virtualization controller, an access request  
6 to access the storage area using the virtual port identification information through the second  
7 port of the host system; and  
8                   upon receipt of the access request from the host system, accessing the storage  
9 area via the fourth path by the virtualization controller.

1                   21.     The method as recited in Claim 20, wherein the access request  
2 comprises data with the virtual port identification information, and wherein accessing the  
3 storage area comprises sending the data associated with the virtual port identification  
4 information from the virtualization controller to the storage area via the fourth path.

1                   22.     The method as recited in Claim 19, wherein the identification used by  
2 the host system to identify the storage area comprises personal information of the storage area.

1                   23.     The method as recited in Claim 19, wherein the identification  
2 information for the second port of the storage device and the virtual port identification  
3 information for the virtualization controller are both correlated with the identification used by  
4 the host system to identify the storage area to define an access path from the host system to  
5 the storage area.

1                   24.     A method of controlling data transfer in a system including a host  
2 system which uses first identification information to access a first storage area in one of a  
3 plurality of storage devices, wherein the first storage area includes data associated with  
4 second identification information identifying the first storage area, the method comprising:  
5                   receiving a first request with the first identification information from the host  
6 system to access the data associated with the second identification information identifying the  
7 first storage area;  
8                   sending a second request with the second identification information to the first  
9 storage area;  
10                  receiving data corresponding to the second request from the first storage area;  
11 and  
12                  sending the received data to the host system.

1                   25.     The method of controlling data transfer as recited in Claim 24, further  
2 comprising:  
3                   receiving from a managing unit a command of data transfer from the first  
4 storage area to a second storage area in one of the plurality of storage devices;  
5                   sending an access request to the first storage area with the second  
6 identification information;  
7                   receiving data corresponding to the access request from the first storage area;  
8                   sending the received data to the second storage area;  
9                   correlating the first identification information with a third identification  
10 information for identifying the second storage area to produce correlation information, and  
11 registering and storing the correlation information.

1                   26.     The method of controlling data transfer as recited in Claim 25, further  
2 comprising:

3 receiving a third request with the first identification information from the host  
4 system, the first identification information being correlated with the third identification  
5 information based on the stored correlation information;  
6 sending a fourth request with the third identification information to the second  
7 storage area;  
8 receiving data corresponding to the fourth request from the second storage  
9 area; and  
10 sending the received data to the host system.